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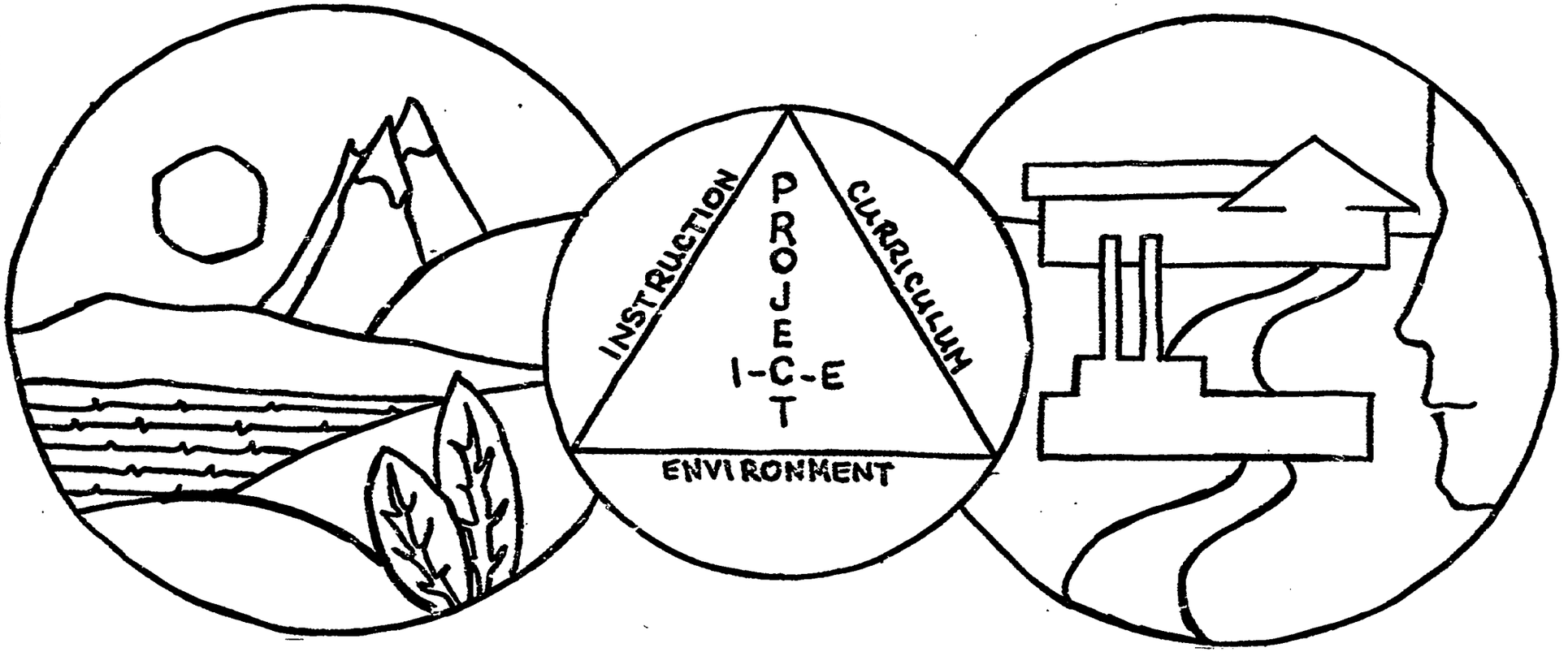
ABSTRACT

This industrial arts guide, for use in grades 7-12, is one of a series of guides, K-12, that were developed by teachers to help introduce environmental education into the total curriculum. The guides are supplementary in design, containing a series of episodes (minilessons) that focus on the economical use of materials and resources and the problems of economic gain versus environmental loss. The episodes are built around 12 major environmental concepts that form a framework for each grade or subject area, as well as for the entire K-12 program. Although the same concepts are used throughout the K-12 program, emphasis is placed on different aspects of each concept at different grade levels or in different subject areas. This guide focuses on aspects such as wood working, drafting, and electricity. The 12 concepts are covered in one of the episodes contained in the guide. Further, each episode offers subject area integration, subject area activities, interdisciplinary activities, cognitive and affective behavioral objectives, and suggested references and resource materials useful to teachers and students. (Author/TK)

ENVIRONMENTAL EDUCATION GUIDE



INDUSTRIAL ARTS 7-12

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FORWARD TO PROJECT I-C-E ENVIRONMENTAL EDUCATION GUIDES

In 1969, the First Environmental Quality Education Act was proposed in the United States Congress. At the time of the introduction of that legislation, I stated:

"There is a dire need to improve the understanding by Americans of the ominous deterioration of the Nation's environment and the increasing threat of irreversible ecological catastrophe. We must all become stewards for the preservation of life on our resource-deficient planet."

In the three years since the Environmental Education Act was passed by the Congress, much has happened in the United States to reinforce the great need for effective environmental education for the Nation's young people. The intensive concern over adequate energy resources, the continuing degradation of our air and water, and the discussion over the economic costs of the war against pollution have all brought the question of the environmental quality of this nation to a concern not merely of aesthetics but of the survival of the human race.

The intense interest by the public in the quality of our lives as affected by the environment clearly indicates that we cannot just use incentives and prescriptions to industry and other sources of pollution. That is necessary, but not sufficient." The race between education and catastrophe can be won by education if we marshall our resources in a systematic manner and squarely confront the long-term approach to saving our environment through the process of education.

As the incessant conqueror of nature, we must reexamine our place and role. Our world is no longer an endless frontier. We constantly are feeling the backlash from many of our ill-conceived efforts to achieve progress.

Rachel Carson's theme of "reverence for life" is becoming less mystical and of more substance as our eyes are opened to much of the havoc we have wrought under the guise of progress. A strong commitment to an all-embracing program of environmental education will help us to find that new working definition of progress that is a pre-requisite to the continued presence of life on this planet.

- Senator Gaylord Nelson

INDUSTRIAL ARTS AND THE ENVIRONMENT

PREFACE

Industrial Arts students are users of the resources that are needed by all. Being made aware of this is probably more important today than at anytime in the past. Newspapers, magazines, and other media are constantly reminding us of shortages and the need to conserve.

In industrial arts, many different kinds and types of materials are being used. Teachers have the opportunity and obligation to show and demonstrate economical use of these resources and materials in a very positive way.

It is a known fact industry has been more interested in economic gain than environmental losses. This concept is easily related to any area of industrial arts. An example can be shown in the study of project planning, production of lumber, steel making, exhaust emission, paper making and many others. The teacher may choose the class activity that best fits his subject area. Not all activities must be used. Topics and terms are provided so students may do extra credit work in areas that suit their school or community.

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DIRECTIONS FOR USING THIS GUIDE

This guide contains a series of episodes (mini-lesson plans), each containing a number of suggested in and out of class learning activities. The episodes are built around 12 major environmental concepts that form a framework for each grade or subject area, as well as for the entire K-12 program. Further, each episode offers subject area integration, multi-disciplinary activities, where applicable, both cognitive and affective behavioral objectives and suggested reference and resource materials useful to the teacher and students.

1. This I-C-E guide is supplementary in design--it is not a complete course of study, nor is its arrangement sequential. You can teach environmentally within the context of your course of study or units by integrating the many ideas and activities suggested.

2. The suggested learning activities are departures from regular text or curriculum programs, while providing for skill development.

3. You decide when any concepts, objectives, activities and resources can conveniently be included in your unit.

4. All episodes can be adapted, modified, or expanded thereby providing great flexibility for any teaching situation.

5. While each grade level or subject area has its own topic or unit emphasis, inter-grade coordination or subject area articulation to avoid duplication and overlap is highly recommended for any school or district seeking effective implementation.

This total K-12 environmental education series is the product of 235 classroom teachers from Northeastern Wisconsin. They created, used, revised and edited these guides over a period of four years. To this first step in the 1,000 mile journey of human survival, we invite you to take the second step--by using this guide and by adding your own inspirations along the way.

PROJECT I-C-E TWELVE MAJOR ENVIRONMENTAL CONCEPTS

1. The sun is the basic source of energy on earth. Transformation of sun energy to other energy forms (often begun by plant photosynthesis) provides food, fuel and power for life systems and machines.

2. All living organisms interact among themselves and their environment, forming an intricate unit called an ecosystem.

3. Environmental factors are limiting on the numbers of organisms living within their influence. Thus, each ecosystem has a carrying capacity.

4. An adequate supply of clean water is essential to life.

5. An adequate supply of clean air is essential for life.

6. The distribution of natural resources and the interaction of physical environmental factors greatly affect the quality of life.

7. Factors such as facilitating transportation, economic conditions, population growth and increased leisure time influence changes in land use and population densities.

8. Cultural, economic, social, and political factors determine man's values and attitudes toward his environment.

9. Man has the ability to manage, manipulate and change his environment.

10. Short-term economic gains may produce long-term environmental losses.

11. Individual acts, duplicated or compounded, produce significant environmental alterations over time.

12. Each person must exercise stewardship of the earth for the benefit of mankind.

A "Concept Rationale" booklet and a slide/tape program "Man Needs His Environment" are available from the I-C-E RMC to more fully explain these concepts.

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Industrial Arts

E. S. E. A. Title III -- PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 1 - Energy **SUBJECT** Industrial Arts (7-12)

ORIENTATION How a tree grows. **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

List 5 conditions which will result in optimum tree growth. Determine the condition(s) responsible for a given condition of trees. The conditions will be presented in the form of pictures or while on a field trip.

Affective:

Identify factors which positively and/or negatively affect tree growth and quality within his community and propose a remedy (procedure or materials) to improve the growth and quality.

Skills Used:

1. Selective cutting
2. Maximum growth
3. Annual Rings pattern (how related to grain pattern)
4. Proper methods of tree placement in planting for greatest growth.

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Filmstrip, Trees for 2001.
B. Discussion on presentation.
   1. Which trees showed greatest growth? Why?
   2. Why didn't other trees show same progress?
      a. Density of growth area
      b. Tree management, etc.
C. Offer lumber samples for comparison.
   1. Densily planted vs. sparsely planted area (shade effects)
   2. Growth of pruned tree vs. neglected tree.
D. Open discussion--tree growth as observed by students.
E. Suggest and carry out methods of improving Forest Management.

Outside or Community:

A. Extension Forester to discuss how a tree grows, show increment bores and tree growth rates and show how timber production can be increased by better management.
B. Have students inspect own area for tree growth conditions (Optional).

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Life of the Forest, Jack McCormick,
McGraw-Hill.
Woodworking for Industry,
John L. Feirer, Chas. A. Bennett Co.
Exploring Woodworking,
Fred W. Zimmerman
Goodheart-Willcox.

Audio-Visual:

Teacher-made slide series.
Sample collection.
Paper Makes Wisconsin Great,
Project ICE, Filmstrip, Teachers Guide.
Tree Growth Chart,
Frank Paxton Lumber Company,
Chicago, Illinois.
Tree is a Living Thing, film #0073,
BAVI.
Filmstrip: Trees for 2001,
Project ICE RMC #FS St 23.

Community:

E. S. E. A. Title III — PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 2 - Ecosystem **SUBJECT** Industrial Arts (7-12)

ORIENTATION Clean-Up **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

Apply the rules for properly cleaning an area when the clean-up period arrives, and not only completed his responsibility, but also check overall results against class developed standard.

Affective:

Appreciate that all living systems interact among themselves and their environment. Actively participate in clean-up as a combined effort, not an effort by individuals.

Skills Used:

1. Co-operation
2. Responsibility
3. Benefits of clean-up
   a. Neater work
   b. Equipment in proper place
   c. Better working atmosphere
   d. Safer place to work

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Let clean-up go for one day.
B. Allow students to work 2nd day in messy area.
C. Evaluate on 3rd day the need for clean-up and relate it to the shop production and environment.
D. Organize schedule of duties and responsibilities stressing teamwork.
E. Discuss and compare results of clean-up vs. no clean-up and discuss group interaction as it relates to clean-up.

Outside or Community:

A. Field trip to local manufacturing area to view practical applications and advantages of neatness and cleanliness.
B. Presentation by industrial commission representative on safety and production as related to neatness and teamwork.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Woodworking for Industry,
John L. Feirer
Chas. A. Bennett Company.
Modern Carpentry, Willis H. Wagner,
Goodheart-Willcox.
General Shop Woodworking,
Fryklund and LaBerge
McKnight and McKnight.

Audio—Visual:

Industrial Arts: A Safe Shop
University of Illinois.
#7331 School Shop Safety, BAVI.

Community:

Safety Inspector
Industrial Commission

1. Develop methods of making clean-up responsibility more efficient.
2. Develop list on where else a team clean-up effort would be beneficial.

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental:

Integrated with:

CONCEPT NO. 3 - Carrying Capacity

SUBJECT Industrial Arts (7-12)

ORIENTATION Crowding in the Shop.

TOPIC/UNIT Woods

BEHAVIORAL OBJECTIVES

Cognitive:

List and explain three physical and three psychological effects of environmental crowding using specific shop areas as examples.

Affective:

Submits that crowding results in adverse physical and psychological conditions.

Skills Used:

1. Hazards in environmental crowding.

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

A. Conduct experiment around following conditions:
   1. Develop simple task, i.e., saw off lumber layout and drill 4 holes.
   2. Provide only one each of tools required.
   3. Limit time.
   4. Limit work area to one table.
   5. Mass production not allowed.

B. Discuss personal and physical feelings experienced during experiment.
   1. Low production
   2. Confusion
   3. Frustration
   4. Irritability
   5. Waste
   6. Injury

C. What happens if this happened in town?

D. Relate results experienced during experiment to Concept 3.

Outside or Community:

A. Psychologist
B. Community Planning Committee
C. Real Estate Developer

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications:	
Audio–Visual: #53525 Man's Effect on the Environment, University of Illinois Champaign, Illinois.	
Community: Psychologist or Sociologist Community Planning Committee Real Estate Developer	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 4 - Water

SUBJECT Industrial Arts (7-12)

ORIENTATION Control of Water Run-Off

TOPIC/UNIT Woodworking

BEHAVIORAL OBJECTIVES

Cognitive:

List five advantages of planting and cutting to control water run-off. Predict the outcome of the environmental condition change as a result of a given water run-off practice for five years.

Affective:

Propose feasible ways to control water run-off in specified areas. Criticize farming practices that allow water to run off without slowing down.

Skills Used:

1. Selective cutting can control water run-off.
2. Reforestation practices
3. Run-off control minimizes stream pollution.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion centered around film strips and/or locally produced slides, showing difference of water run-off on properly cut and planted versus improperly cut and planted.
B. Discussion by local forester about how selective cutting can control run-off and improve tree stand (possible field trip).

Outside or Community:

A. Planting trees.
B. Helping in selective cutting.
C. Long-term--check on water quality as checked by planting.
D. Long-term--photograph.
E. Student developed slide series of local conditions.
F. Field trip with local forester.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Torit - Dust Collection Systems.	1. Revegetate a stream (under direction of Conservation Dept.) to control water run-off. 2. Clean out a local stream.
Audio—Visual: Teacher/student developed slide series. #01893 Forest Products. University of Illinois Champaign, Illinois. #0760, The Forest Produces, BAVI. The Mighty Western Forest, Western Wood Products 700 Veon Building Portland, Oregon 97204.	
Community: DNR ASCS	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 5 - Air **SUBJECT** Industrial Arts (7-12)

ORIENTATION Relationship of Clean Air to Health **TOPIC/UNIT** Woodworking

BEHAVIORAL OBJECTIVES

Cognitive:

List five health hazards due to air pollution in a wood-working shop. Evaluate each of the shop regulations, having to do with clean air in the shop, to determine if they do assist in maintaining clean air.

Affective:

Take preventive measures to stop air pollution when working with wood. Agree to wear proper equipment when working with wood, to protect himself.

Skills Used:

1. Ways to reduce air pollution in a shop environment.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Dust collection system will not be used for a one-day period to show students how dust will collect on projects, clothes, tools and machines.
B. During next working period, dust collector will be used and students will observe difference in working conditions.
C. Student-small group, busy session.

Outside or Community:

A. Inspector from State Dept. of Labor, Management and Human Relations, to discuss regulations relative to clean air in shop atmosphere.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications:	
Audio—Visual:	
Community: Local Representative of Dept. of Labor, Management and Human Relations.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 6 - Resources **SUBJECT** Industrial Arts (7-12)

ORIENTATION Lumber Cost Increases **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

Research, create, and compare itemized cost sheets of lumber 20 years ago, 10 years ago, and the present time and present his findings to the class via oral report and visual aids.

Affective:

Suggest that there is an increase in price of a resource due to diminishing resources and resource location in the lumbering industry.

Skills Used:

1. Cost analysis
2. Timber forest and lumbering locations
3. Graphic illustrations
4. Cause-effect thinking

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Discuss cost sheets
   1. What is included
   2. Format
B. Have students compile cost sheets of 20, 10, and 1 year ago for a standard article in local area.
C. Discuss local area cost sheets, comparing cost fluctuations and probable causes over the years.
   1. Availability
   2. Forest management
   3. Demand
   4. Additional expenses
D. Compare and discuss: Local area cost sheets versus cost sheets from other geographical area. (teacher furnished) Discuss reasons for variations.
   1. Location
   2. Transportation
   3. Forest Management
   4. Demand

Outside or Community:

A. Forest manager
B. Local lumber dealer to discuss reasons for great change in lumber prices.
C. Sawmill operator

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Catalogs from lumber dealers. Woodworking for Industry, John L. Feirer, Chas. A. Bennett Co. General Shop Woodworking, FryKlund & LaBerge, McKnight & McKnight **Audio–Visual:** #0791 Logging In Wisconsin About 1938, BAVI. **Community:** Local lumber dealers	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 7 - Land Use **SUBJECT** Industrial Arts (9-12)

ORIENTATION Leisure Time **TOPIC/UNIT** Woodworking

BEHAVIORAL OBJECTIVES

Cognitive:

List 10 new businesses and industries created by the do-it-yourself concept of the American public. Evaluate a leisure time activity in terms of costs in time and resources versus the benefit derived by the individual.

Affective:

Make better use of his leisure time through the use of do-it-yourself woodworking projects. Promote the use of do-it-yourself woodworking projects.

Skills Used:

1. Efficient use of leisure time
2. Research

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will research how the do-it-yourself leisure activities have changed industries, transportation, and population centers, by means of:
   1. Personal interview-local industrialist, businessmen, etc.
   2. Magazine/newspaper reading
   3. Books
   4. A-V materials
   5. Letters of inquiry to various companies
   6. Small-group brainstorming

B. Develop program of leisure time activities involving woodwork.
   1. What tools are needed (emphasize hand tools)
   2. What impact will these activities have on manufacturing and land use.

Outside or Community:

A. Local building supply dealers.
B. Operators of craft and hobby shops.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Do-It-Yourself Encyclopedia. Project plan books. Magazines, Better Homes and Gardens, Workbench, Popular Mechanics, etc. **Audio–Visual:** **Community:** Local building supply dealer. Local hobby and craft shop personnel.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 8 - Values and Attitudes **SUBJECT** Industrial Arts (8-12)

ORIENTATION Economic Use of Material **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

Define resawing.
Describe three ways by which the minimum wastage is assured for a given project.

Affective:

Propose that resawing lumber for panels saves not only materials but also money thus minimizing waste.
Resaw lumber for his project whenever possible. Plan his project pieces and cutting to keep the materials needed to the minimum.

Skills Used:

1. Use of the bandsaw for resawing.
2. Project planning for resawing.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion of how can the material we use in the shop be used most economically in the following areas:
   1. Project design (standard material)
   2. Material layout (minimize waste)
   3. Reworked material (resawing)
B. Bandsaw demonstration
   1. Resawing
      a. Blade width
      b. Fence
      c. Feather board
   2. Handling resawed material
      a. Gluing and clamping
      b. Surfacing
   3. Design alternatives with resawed material

Outside or Community:

A. Local shop owners talk about reusable material in their business.
B. Chamber of Commerce list of areas businesses. Student evaluate which produce the "most useless" wastes.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Woodworking for Industry,
John L. Feirer
Chas. A. Bennett Co.
Exploring Woodworking,
Fred W. Zimmerman
Goodheart-Willcox.

Audio–Visual:

BAVI #2640 Danish Design.
#03230 Man and The Forest, Part 1.
#03370 Man and The Forest, Part 2.
University of Illinois.

Community:

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 9 - Management **SUBJECT** Industrial Arts (9-12)

ORIENTATION Super Trees **TOPIC/UNIT** Woodworking

BEHAVIORAL OBJECTIVES

Cognitive:

Construct a graph that illustrates how a tree will produce immensely more under growing conditions manipulated by man than in the natural state. Evaluate the program of experimentation designed to determine the best management practices in light of its high costs.

Affective:

Plant and care for trees in a manner which will produce maximum growth.

Skills Used:

1. How to produce trees that will yield maximum material in the shortest growing time possible.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Presentation by the DNR on how man is manipulating the environment in which a tree grows to produce maximum yield.

Outside or Community:

A. Field trip to an area such as the:
   1. Seed orchard
   2. Nicolet National Forest East of Langlade, Wis., Highway 64.
   3. Tree farms operated by paper mills and lumber companies.

B. DNR to discuss manipulating the environment in which trees grow.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Exploring Woodworking,
Fred W. Zimmerman
Goodheart-Willcox.
General Shop Woodworking,
FryKlund & LaBerge
McKnight & McKnight.
Woodworking for Industry,
John L. Feirer
Chas. A. Bennett Company.

Audio—Visual:

#52386 Conservation in Our Forest.
#01889 Forest Conservation,
University of Illinois
Champaign, Illinois.
The Forever Living Forest,
Film, Calif. Redwood Assoc.
San Francisco, Calif. 94111.

Community:

D.N.R.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 10 - Economic Planning **SUBJECT** Industrial Arts (7-12)

ORIENTATION Production of quality saw logs. **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

List ten conditions which effect the quality of a saw log. View a log and determine its approximate grade, giving reason(s) why it may not be the highest grade. Analyze the statement, "Most low-grade logs are the result of natural conditions, therefore, why try to improve the management."

Affective:

Show awareness of the adverse effects of cutting for pure profit by citing examples in the community.

Skills Used:

1. Forest Management
   a. Selective cutting
   b. Proper pruning or trimming
   c. Use of a crushing stick

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Develop a collection of boards which contain defects which effect the grade of the board.
   1. Natural Defects
      a. knots
      b. wanes
      c. shakes
      d. natural holes
      e. staining
   2. Man-made Defects
      a. splits
      b. cracking
      c. checking
      d. honeycombing
      e. caseharding
      f. man-made holes
      g. staining

B. Discuss what happened to cause the various defects.

C. Were these defects a result of "Rushing?"

D. How can growing quality be controlled?

E. Presentation by local forest ranger.

F. Develop slide series of wood lots--cut for the "quick buck" vs. cut for management.

Outside or Community:

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Woodworking for Industry, John L. Feirer Chas. A. Bennett Company. Exploring Woodworking, Fred W. Zimmerman Goodheart-Willcox. Cabinetmaking and Millwork, John L. Feirer Chas. A. Bennett Company. **Audio–Visual:** #81995 Working Forest, University of Illinois Teacher developed slides. **Community:** Local forester.	

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 11 - Individual Acts **SUBJECT** Industrial Arts (7-12)

ORIENTATION Material Use vs. Waste **TOPIC/UNIT** Woods

BEHAVIORAL OBJECTIVES

Cognitive:

Calculate the percentage of waste for a given project with pieces layed out in a particular way. Layout the pieces for a given project for the least wasted materials.

Affective:

Select material and work with it in a manner that results in minimum or zero waste. Efficient use and careful workmanship reduces waste and results in savings in money and environment.

Skills Used:

1. Efficient use of materials
2. Working allowance
   a. Hand tools
   b. Machine
3. Multiplied waste
4. Multiplied carelessness (scrap/rejects)

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion of working allowance.

(Poem)

"Half an inch longer 'tis we saw
Quarter of an inch wider is the law
An eighth on thickness is enough
Where sawing lumber from the rough."

B. Students will lay-out assigned projects on paper representing 4 x 8 plywood, calculate % of waste.
C. Discuss waste multiplier for both boards versus plywood-- % of rejects.
D. Students will go to local lumber yard and obtain price lists to realize the amount of money spent for waste.

Outside or Community:

A. Quality control engineer to discuss waste.

SUGGESTED RESOURCES

Publications:

Woodworking for Industry,
John L. Feirer
Chas. A. Bennett Company.
Cabinetmaking and Millwork,
John L. Feirer
Chas. A. Bennett Company.
Exploring Woodworking,
Fred W. Zimmerman
Goodheart-Willcox.

Audio—Visual:

#50750 American Sawmill.
#03230 Man and The Forest,
Part 1, University of Illinois.
Time of Change - The Story of Hardboard,
Film, Georgia Pacific Corp.
P. O. Box 311
Portland, Oregon 97207.

Community:

Quality control engineer
D.N.R.

CONTINUED OR ADDED LEARNING ACTIVITIES

1. Students will redesign projects to use less materials thereby freeing materials for other uses.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 12 - Stewardship **SUBJECT** Industrial Arts (9-12)

ORIENTATION Building Codes and Zoning Laws **TOPIC/UNIT** Woods - Building Trades

BEHAVIORAL OBJECTIVES

Cognitive:

Describe how building codes and zoning laws affect and dictate land use. Explain the basis for most of the building codes and land use codes in the community or county. Evaluate the effectiveness of the land use codes in maintaining appropriate uses for land areas in the community or county.

Affective:

Develop and defend a code or law for a given tract of land which reflects "proper" land use.

Skills Used:

1. Zoning laws
2. Building codes
3. Proper land use

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Discuss how building codes and zoning laws dictate land use.
   1. Land use (type of area)
      a. Commercial
      b. Residential
      c. Recreational
   2. Building placement
   3. Building spacing

B. Discuss reasons behind building code regulations.
   1. How do they benefit people?
      a. Planners
      b. Builders
      c. Residents
   2. How do they hinder people?
      a. Planners
      b. Builders
      c. Residents

C. Discuss correlation between good building codes and zoning laws and good resulting environmental and ecological conditions.

Outside or Community:

A. Local government official to explain reasoning behind codes and zoning.
B. Zoning Commissioner, town or village official.
C. Local Building Inspector.
D. Architect.
E. Local contractor.
F. Safety and Sanitation Inspector.
G. D.N.R. Representatives and films concerning "before and after development."

SUGGESTED RESOURCES

Publications:

Modern Carpentry,
Willis H. Wagner
Goodheart-Willcox.
Architecture, Drafting and Design,
Hepler and Wallach, McGraw-Hill.

Audio-Visual:

#01121 Cities: How They Grow,
University of Illinois.
Film: Cry of the Marshland,
ICE RMC #390.
Urban Sprawl, Film:
ICE RMC #430.

Community:

All sources listed under "Outside Resources and Community Activities" on reverse side.

CONTINUED OR ADDED LEARNING ACTIVITIES

1. Develop easy reference chart for basic building codes and zoning laws.

Extra Credit Topics and Terms for Students Environmental Study and Exploration.

WOODWORKING

1. Tree Farming
2. Aniline Dyeing
3. Blushing
4. Felting Process
5. Earth Pigments
6. Hardboard Production
7. Naptha
8. Particleboard Production
9. Rottenstone
10. Shellac
11. Turpentine

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 1 - Energy **SUBJECT** Drafting (7-12)

ORIENTATION How Sun Energy is Related to the Diazo Process **TOPIC/UNIT** Basic, Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Explain the basic steps in the Diazo process. Produce a quality Diazo Print--properly exposed, using an appropriate original negative. Compare type of print obtained by each of the methods, Sun Frame and Diazo.

a. color quality
b. cost
c. time
d. preparation

Affective:

Believes in importance of original's overall quality and exposure time to print development time and quality.

Skills Used:

1. Line weight quality
2. Operation of Diazo Machine
3. Overall neatness
4. Selection of Diazo reproduction materials (if more than one are used).

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Demonstrate need for translucent original--run print using opaque and translucent original. Compare results.
B. Show film, "The Mystery of the Cosmic Rays"
C. Make print with Sun Frame method.
D. Make print with Diazo process.
E. Have students compare and discuss process and results. Advantages and disadvantages.
F. Point out Diazo Process is controlled Sun energy.
G. Develop bulletin board for trouble shooting Diazo prints (if this happened--you did this wrong).
H. List other "Sun Energy" uses.

Outside or Community:

A. Visit commercial blueprint operation.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Industrial Arts Drafting, Walker-Plevyak, Goodheart-Willcox Co. Drafting Technical Comm., Lawrence S. Wright, McKnight & McKnight. **Audio–Visual:** Walt Disney's "The Mystery of the Cosmic Rays." **Community:** Professional draftsman.	

E. S. E. A. Title III - PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 3 - Carrying Capacity **SUBJECT** Drafting (7-12)

ORIENTATION Joint Design & Carrying Capacity **TOPIC/UNIT** Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Select and/or design joint(s) that best suits the job, (appearance, strength, ease of making, etc.) for a given project. Compare furniture in terms of the joints and fasteners used to determine whether more expensive furniture pieces have a greater life expentancy due to use of better ones.

Affective:

Investigate how grain, materials, fasteners, fit affect joint quality. Criticize the use of a particular fastener or joint as being inadequate for the use intended for the project.

Skills Used:

1. Material strength
2. Joint use
   a. Inside-Outside
   b. Structural appearance
3. Ease of construction

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Have students design simple joints for strength and/or appearance.
B. Develop test for joints around available equipment, test for:
   1. Strength
      a. Shear
      b. Stress
      c. Compression
      d. Tensile
   2. Appearance (pure value judgement)
   3. Ease of making and application.
C. Incorporate joints in project drawing.
D. Bean bag discussion "Draw parallels between joint breakdown and ecosystem breakdown." (i.e. Poorly constructed or neglected joint breaks down under stress, as ecosystem does when congested, abused or neglected.

Outside or Community:

A. Field trip to local manufacturing plant. Talk with product engineer.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Drafting Technical Communication, Lawrence S. Wright McKnight & McKnight, Bloomington, Illinois 1968. Mechanical Drawing French & Svensen McGraw-Hill, 1966. Drafting Technology & Practice William P. Spence, Chas. A. Bennett Co. 1973. **Audio–Visual:** Stanley Tools Filmstrips Charts Movies BAVI #2666 Design for ARC Welded Structures. BAVI #1217 Using Nails and Screws. **Community:** Forest Products Laboratory	Continued evaluation of joint selection. Develop a collection of joints. Conduct a contest for joint strength or whatever quality wanted.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 4 - Water **SUBJECT** Drafting (7-12)

ORIENTATION Waste Water **TOPIC/UNIT** Basic, Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

List the types of paper used in drafting. Name the paper companies having waste water treatment facilities within a 20 mile radius of the school. Explain how treatment plants take impurities out of the impure water.

Affective:

Demonstrate an appreciation of the effect of clean water on recreation, fishing, etc. by listing clean water areas in the county and types of animals and recreation found in the area. Investigate the purpose of a waste water treatment plant.

Skills Used:

1. Paper composition
2. How paper is made
3. The treatment of water after it is used in a paper mill.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will study types of paper used in drafting.
   1. Rag
   2. Sulphite
B. In connection with paper making student will study water treatment facilities in paper companies.
   1. Machine used in treatment
   2. Chemicals used in treatment
   3. Short and long term plans for water treatment facilities.
C. Develop bulletin board flow charts showing waste water treatment process.

Outside or Community:

A. Field trip to a paper mill.
B. Public relations department of a local paper mill, to discuss types of paper.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Books:
Pulp and Paper,
500 Howard Street
San Francisco, Calif. 94105.
American Paper Industry
2570 Devon Avenue
Des Plaines, Illinois 60018.
Chem Paper Processing
Hale Publishing Company
One Pank Street
Stanford, Conn. 06901.

Audio—Visual:

Recycling Paper
Riverside Paper Company
Appleton, Wisconsin
Great White Trackaway
Hammermill Paper Company
Erie, Pennsylvania.

Community:

Public Relations Department of an area paper mill.
Contact State Board of Health for current literature on clean and safe water.

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental:

Integrated with:

CONCEPT NO. 5 - Air

SUBJECT Drafting (11-12)

ORIENTATION Green Areas

TOPIC/UNIT Basic, Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Design a subdivision including adequate vegetation areas according to the principles of good landscaping. List two or three ways in which vegetation areas promote air quality.

Affective:

Selects shrubs and grass as being important factors in a clean air program in a community.

Skills Used:

1. Plot planning
2. Space conservation
3. Organic architecture

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Teacher will explain and lead discussion on photosynthesis.
B. Determine (as a result of discussion) why trees, shrubs, and other greenery are important to clean air.
C. Use of trees as visual and noise screens.
D. Have students roughly design subdivision by using plot plans.
E. Evaluate subdivisions on:
   1. green areas
   2. % of house to lot
   3. privacy area
   4. practicality

Outside or Community:

A. Presentation by subdivision planner who utilizes vegetation areas.
B. Field trip or area study of local subdivisions to see if studied concepts are actually applied.
C. Landscape architect to discuss green areas.

SUGGESTED RESOURCES

Publications:

Architecture Drafting and Design,
Hepler & Wallach
McGraw-Hill, 1965.
Soil Surveys and Land Use Planning,
Soil Science Society of America and
American Society of Agronomy, 1966.

Audio–Visual:

BAVI #6730 New Guidelines for the
Well-Landscaped Home.
The Green City, Film, I-C-E RMC #440.

Community:

Subdivision planner.

CONTINUED OR ADDED LEARNING ACTIVITIES

Have students continue searching for "Ideal" sub-
division in areas of vegetation usage for air
quality.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 6 - Resources **SUBJECT** Drafting (7-12)

ORIENTATION Project Planning **TOPIC/UNIT** Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Plan projects to use as little natural resources as possible to accomplish a given objective.

Affective:

Choose materials which reflect low waste when given guidelines for a specific project.

Skills Used:

1. Maximum material usage
2. Production planning
3. Production efficiency

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Design and draw projects that will be of a nature that will put natural resources to their greatest use--as little waste as possible.
Example:
Design bird houses from a 4 x 8 plywood sheet.
   1. Bird house requirement
      a. Floor size
      b. Hole size
      c. Hole above floor
      d. Bird
   Design house cutting diagram.

B. Recycling project for paper used in classroom.
   1. Find paper prices for various grades.
   2. Design paper recycling program.
      a. Space required
      b. Collection methods
      c. Details of sale

Outside or Community:

A. D.N.R. Representative to discuss types of bird houses.
B. Paper Recycling Company (contact rep. for prices and terms.)

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

DNR Publications.
Drawing for Product Planning,
George E. Stephenson
Chas. A. Bennett Company, Inc. 1970.

1. On every project reflect material usage.
2. Develop a collection of projects which reflect excellent material usage.

Audio-Visual:

Filmstrip: Design in Wood,
McGraw-Hill.

Community:

Design engineers from local manufacturer.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 7 - Land Use **SUBJECT** Drafting (11-12)

ORIENTATION Community Planning **TOPIC/UNIT** Basic, Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Explain how lack of planning years ago is now producing land use problems in his local community.

Affective:

Work with school and later community groups for better community planning and land use.

Skills Used:

1. How to help in community planning for maximum land usage.
2. Basic map making and reading of topographical maps.
3. Use of cameras and tape recorders.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Use USGS Topo Maps of local area to visualize your community.
B. Students working in groups will produce a slide presentation of good and poor land use in the community.
C. Discussion on steps to be taken for better local land use.
D. Design ideal city with services.
   1. water
   2. sewage
   3. electrical
   4. fire
   5. police

Outside or Community:

A. Community Planners make a presentation of future plans for the community.
B. Field trip around the community with students recording comments on tape and taking pictures for future presentations.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: HUD literature. Architecture Drafting and Design, Hepler & Wallach McGraw-Hill, 1965. Soil Surveys and Land Use Planning, Soil Science Society of America and American Society of Agronomy, 1966. **Audio–Visual:** Student and teachers developed slides. Cry of the Marshland, ICE Noisy Landscape - film, CESA 9, Project ICE. The Best We Can Do, film, Project ICE. Urban Sprawl, film, ICE RMC #430. **Community:** City plan commission.	Develop picture collection of good and poor land use. Conduct a contest: 1. Select a piece of property within the community which presents a future problem, i.e., gravel pit, swamp. Have students develop a long term solution which will reflect best possible use for the community.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 8 Values and Attitudes **SUBJECT** Drafting (9-12)

ORIENTATION Material usage and re-engineering **TOPIC/UNIT** Mechanical, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Identify objects that are both functional and economical to produce in a given shop.

Affective:

Promote the saving of materials normally used in excess. Investigate possible ways of using waste materials from a given project, to make a salable object.

Skills Used:

1. Material usage
2. Redesign
3. Function

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. General concept. Include in the design the idea of the importance of using materials within limits. Usually there is too much material used for a given piece of construction.
B. Students in engineering, drafting can divide up the parts to save on excess materials.
C. Redesign parts to use standard materials to cut down machine time and/or save assembly operations.

Outside or Community:

A. Product engineer local manufacturer to discuss re-engineering.
B. Forest Products Lab. (wood area)

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Drawing for Product Planning,
George E. Stephenson
Chas. A. Bennett Co., Inc. 1970.
Mechanical Drawing, French & Svensen,
McGraw-Hill, 1966.
Drafting Technology and Practice,
William P. Spence,
Chas. A. Bennett Co., Inc. 1973.

Audio–Visual:

(Metals) BAVI #2666
Design for ARC Welded Structures.

Community:

Local engineer

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental: **Integrated with:**

CONCEPT NO. 9 - Management **SUBJECT** Drafting (11-12)

ORIENTATION Sun Energy and Orientation **TOPIC/UNIT** Basic, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Locate a model home on a given lot location to take fullest advantage of the sun in heating the home. Explain the advantages and values of proper house orientation with the sun.

Affective:

Praise a person for locating his house on a lot so that the maximum use of the sun's heat is possible during winter months.

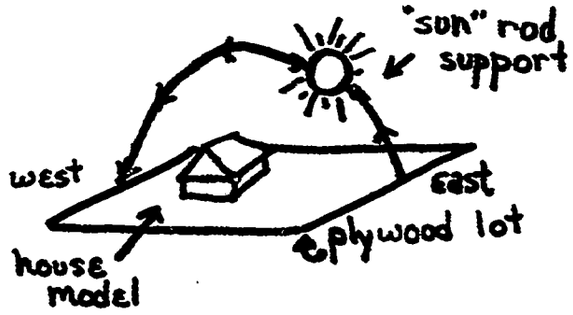
Skills Used:

1. Placement of a house to use sun energy for heat and light.
2. Saving of lighting costs.
3. Saving of heating costs.
4. Reading plot plans, maps, and azimuth charts.

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

NOTE - Model arrangement is used which included room modules to create given house design and home placement in relation to sun.



A. Have class discuss and try various arrangements for desired sun utilization.
   1. Emphasize use of solar energy.
B. Explain zoning limitations.
C. Present and explain azimuth-longitude charts.

Outside or Community:

A. Local architect

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Architecture Drafting & Design, Hepler & Wallach, McGraw-Hill, 1965.	Have students study their own and neighbor's homes to determine in how many cases the home could have been situated better.
Audio—Visual: Teacher made model.	
Community: Local architect.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 10 - Economic Planning **SUBJECT** Drafting (7-12)

ORIENTATION Project planning **TOPIC/UNIT** Architectural, Mechanical

BEHAVIORAL OBJECTIVES

Cognitive:

Make a working drawing of a project that fulfills a given set of needs.

Affective:

Analyze a problem to determine its basic component(s). Attempt to explain the difference in the fit of components in a mass production setting and those produced without mass production.

Skills Used:

1. Project planning
   a. problem analysis
   b. problem solving
   c. working drawing
   d. production
2. Haste makes waste-both time and material.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Show filmstrip Design in Wood, 2nd half.
B. Have class select project to be designed.
C. From class discussion develop list of "needs."
   1. Where will it be used?
   2. How will it be used?
   3. What will it hold?
   4. What materials?
   5. What machines and/or tools available?
   6. How much will it cost?
D. What impact will it have on environment?
   1. Do environmental impact analysis.
E. Depending on groups ability, have groups or individuals solve problem.
F. Have class discuss and evaluate results.

Outside or Community:

A. Local product engineer to discuss design.
B. Have students evaluate mass produced items as they differ from individualized items.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Drawing for Product Planning, George E. Stephenson, Chas. A. Bennett Co., 1970. **Audio--Visual:** Filmstrip: Design in Wood, McGraw-Hill. **Community:** Product engineer.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–013–4

Environmental:

Integrated with:

CONCEPT NO. 11 - Individual Acts

SUBJECT Drafting (11-12)

ORIENTATION Saving of paper and time.

TOPIC/UNIT Basic, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Determine the amount of time and materials necessary to produce a set of construction plans for an average 3-bedroom house. Calculate the amount of paper and time saved by using intermediates for completing a given set of construction drawings.

Affective:

Choose intermediates to save time and materials when given a set of construction plans to complete.

Skills Used:

1. Use of intermediate.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. From a set of house plans, discover how many times the same basic drawing is used.
   1. Floor plan
   2. Electric plan
   3. Heating plan
   4. Plumbing plan
   5. Joist layout
   6. Sub-floor layout
   7. Stud layout

B. Discussion on quickest way to produce necessary prints.

C. Demonstrate:
   Intermediates
   1. Sepia
   2. Eraseable sepia
   3. Intensifier film
   4. Eraseable intensifier film.

D. Through math calculation, find the amount of paper and time saved through the use of an intermediate.

Outside or Community:

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Professional Builder, Sept. 1970 Use of Detailed layouts to Save on Site Cost. **Audio—Visual:** Various intermediates, produced by instructor or previous students. **Community:** Local Architect.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 12 - Stewardship

SUBJECT Drafting (11-12)

ORIENTATION Zoning Laws

TOPIC/UNIT Basic, Architectural

BEHAVIORAL OBJECTIVES

Cognitive:

Design a residential dwelling that conforms to local zoning laws.

Affective:

Support the importance of zoning laws in assuring the best land utilization and aesthetic values.

Skills Used:

1. Zoning laws protect the rights of others.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Presentation and class discussion by a representative of the local zoning committee.
B. Have students identify zoning laws which will affect their problem.
C. Students will realize from class discussion and debate how zoning laws protect the rights of others.
D. Evaluate finished plans in relationship to zoning laws. (Local Building Inspector)

Outside or Community:

A. Zoning Committee Rep. to discuss zoning laws.
B. Local Building Inspector to discuss zoning laws.

SUGGESTED RESOURCES

Publications:

General Architectural Drawing
William E. Wyatt, Chas. A. Bennett Co., 1969.
Architecture Drafting & Design,
Hepler & Wallach, McGraw-Hill, 1965.
Soil Surveys and Land Use Planning,
Soil Science Society of America and American Society of Agronomy, 1966.

Audio-Visual:

Film: Cry of the Marshland, ICE.
#5645, Blue Print for Progress, BAVI.
Best We Can Do, Film, ICE RMC.
Urban Sprawl, film ICE RMC #430.

Community:

Zoning Commission Representative.
Local Building Inspector.

CONTINUED OR ADDED LEARNING ACTIVITIES

Extra Credit Topics and Terms for Students Environmental Study and Exploration.

DRAFTING

1. Drawing Reproduction
2. Welding
3. Casting
4. Forging
5. Landscape Architecture
6. Exposure
7. Organic Architecture

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 1 - Energy

SUBJECT Industrial Arts (9-12)

ORIENTATION Oxygen Production

TOPIC/UNIT Metals

BEHAVIORAL OBJECTIVES

Cognitive:

List how oxygen is used in the welding and cutting process.

Affective:

Evaluates the use of oxygen in the welding and cutting process.

Skills Used:

1. How oxygen is produced.
2. How oxygen is used in the welding process.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion on how oxygen is produced in nature through photosynthesis and commercially through electrolysis.
B. Experiment showing how a candle will burn in the presence of oxygen and go out as oxygen is used.
C. Relate experiment to flame cutting process.
D. Develop relation of electrolysis to sun energy.

Outside or Community:

A. Local Welding Supply House.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Available from welding supply houses for the asking: Oxyacetylene Welding and Cutting, Stuart Plumley McGraw-Hill Airco Welding P. O. Box 124 Broadville, Illinois **Audio—Visual:** Flame charts. **Community:** Rep. from local welding supply house.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 2 - Ecosystem **SUBJECT** Industrial Arts (7-12)

ORIENTATION Clean-up **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Demonstrate a clean-up when the clean-up period arrives. Check overall results.

Affective:

Weighs how all living systems interact among themselves and their environment realizing clean-up is a combined effort not an effort by an individual.

Skills Used:

1. Cooperation.
2. Responsibility.
3. Benefits of clean-up:
   a. Neater work
   b. Equipment in proper place
   c. Better working atmosphere
   d. Safer place to work.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Let clean-up go for one day.
B. Allow students to work next day in messy area.
C. Evaluate on third day the need for clean-up and relate to shop production and environment.
D. Organize schedule of duties and responsibilities stressing teamwork.
E. Discuss and compare results of clean-up versus no clean-up and group interaction as related to clean-up.

Outside or Community:

A. Field trip to local manufacturing area to view practical applications and advantages of neatness and cleanliness.
B. Presentation by industrial commission rep. on safety and production as related to neatness and teamwork.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Metalwork Technology and Practice,
Ludwig & McCarthy
McKnight & McKnight.
Forging and Welding,
Robert E. Smith
McKnight & McKnight.
Metalworking,
T. Gardner Boyds

Audio—Visual:

Industrial Arts: A Safe Shop,
University of Illinois.

Community:

Safety inspector-industrial commission.

1. Develop methods of making clean-up responsibility more efficient.
2. Develop list of places where a team clean-up effort would be beneficial.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 3 - Carrying Capacity **SUBJECT** Industrial Arts (7-12)

ORIENTATION Crowding in Shop **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

List and explain three physical and three psychological affects of environmental crowding and relate them to specific areas.

Affective:

Queries how crowding results in adverse physical and psychological conditions.

Skills Used:

1. Hazards in environmental crowding.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Conduct experiment around following conditions:
   1. Develop simple task i.e. saw off stock layout and drill four holes.
   2. Provide only one each of tools required.
   3. Limit work area to one table.
   4. Limit time.
   5. Mass production not allowed.

B. Discuss personal and physical feelings experienced during experiment.
   1. Low production
   2. Confusion
   3. Frustration
   4. Irritability
   5. Waste

C. What happens if this happened in town?
   1. Slums
   2. Urban crowding

D. Relate experienced results to Concept #3.

Outside or Community:

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Audio–Visual:

#53525, Man's Effect on The Environment,
University of Illinois
Champaign, Illinois.
The Ecological Cycle, Kit #14,
Project ICE.

Community:

Psychologist or Sociologist.
Community planning comm.
Real estate developer.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 4 - Water **SUBJECT** Industrial Arts (7-12)

ORIENTATION Pure Water and Manufacturing **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Demonstrate five methods in which waste water is treated in the metals industry.

Affective:

Investigates how waste water in metal manufacturing is processed to purify it to standards.

Skills Used:

1. How water is used in manufacturing.
2. How waste water quality is maintained.
3. Water quality standards.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Field trip to gain knowledge of water use in manufacturing.
B. Group discussion:
   1. How is water used in the manufacture and processing of metals?
   2. Is the water "pure" when you are finished with it?
   3. (Yes) What is being done to accomplish this?
   4. (No) What can be done to accomplish this?
   5. Is water recycled thru the process or only used once--why?
   6. Is water sent thru local sewage treatment plant? Why--why not?
   7. What control can industry use to prevent sudden discharges into community S.T.P?

Outside or Community:

A. Visit local plants and see how water is used in processing and/or manufacturing of metal.
B. Visit local sewage treatment plant and have engineer explain problems related to treatment of industrial waste.
C. D.N.R. representative to discuss pollution from metal manufacturing.
D. Chemistry instructor.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Forging and Welding, Robert E. Smith McKnight & McKnight. Metalwork Technology & Practice, Oswald A. Ludwig McKnight & McKnight. **Audio–Visual:** Steelmaking Today, #0598, BAVI. Make Steel--But Keep It Clean, #4513, Modern Talking Picture Service. **Community:** D.N.R. Local sewage engineer. Local manufacturer using large quantities of water.	Set up a model sediment pond using three contrasting soils i.e. sand, gravel, and clay. Test the purity of the water before and after piercing thru soil.

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental: **Integrated with:**

CONCEPT NO. 5 - Air **SUBJECT** Industrial Arts (9-12)

ORIENTATION Dealing With Toxic Welding Fumes **TOPIC/UNIT** Metals.

BEHAVIORAL OBJECTIVES

Cognitive:

List the toxic effects of the fumes produced in welding.

Affective:

Promotes the turn in or on of the exhaust system before welding, realizing that ideal conditions are desired; use conservatively.

Skills Used:

1. Effects of welding fumes on an individual.
2. How toxic fumes are handled in industry.
3. How toxic fumes are and can be handled in the shop.

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

A. Demonstrate various welding techniques and observe visible fumes produced.
B. Discuss where these fumes come from, and what their effect is on an individual. (Guest speaker if desired.)
C. Have member of industrial commission explain how such fumes are dealt with in industry.
D. Discuss and brainstorm how fumes can be dealt with in the school shop area.

Outside or Community:

A. Industrial Commission representative to discuss toxic welding fumes.
B. School chemistry teacher to discuss how toxic fumes are produced.
C. Local welding or metal fabricating person to discuss toxic welding fumes.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Forging and Welding,
Robert E. Smith,
McKnight & McKnight.
Oxyacetylene Welding and Cutting,
Stuart & Plumley,
McGraw-Hill.

Audio—Visual:

Oxyacetylene Welding: Safety and Operations,
#53445 University of Illinois.

Community:

Industrial Commission Rep.
School chemistry teacher.
Local welder.
Local welding supplier.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 6 - Resources **SUBJECT** Industrial Arts (7-12)

ORIENTATION Strip mining and its effects **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Determine and identify five adverse conditions created by strip mining.

Affective:

Investigates how strip mining affects geographic conditions.

Skills Used:

1. Ecological management of strip mining.
2. Methods of mining raw ore and its effect on our environment.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Research the following aspects of strip mining:
   1. Site selection
   2. Site development
   3. Community involvement
   4. Side effects:
      a. physical
      b. social
      c. mental

B. Field trip and/or movie/ filmstrip/slides to experience how strip mines are being "Recycled" for better land use.

C. Discuss effects of mining in relationship to community.
   1. How these materials help us?
   2. How present mining techniques destroy natural environment.
   3. Possible alternatives and/or improved processes.

Outside or Community:

A. Field trip to open pit and/or strip mine to see mining operations and to question about land reclamation. (sand, gravel in Wisconsin)

B. Library research.

C. D.N.R. information on strip mining.

D. Legislative Reference Library. State Capitol for state laws and bills on mine regulations.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Forging and Welding, Robert E. Smith, McKnight & McKnight. Encyclopedia. **Audio–Visual:** Mining for Nickel, Rothacker Motion Picture 241 W. 17th St., New York, New York. Continuous Excavating, New Concept in Mining More, Bigger, Deeper Blast Hold Drills, Ideal Pictures 4431 W. North, Milwaukee, Wisconsin. Field Trips Out of the Ordinary, ICE RMC, Kit #48. **Community:** D.N.R. Local strip mine.	1. Develop slide series and/or picture set of "Good vs. Bad" strip mining.

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental: **Integrated with:**

CONCEPT NO. 7 - Land Use **SUBJECT** Industrial Arts (7-12)

ORIENTATION Leisure Time Effects Land Use **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Determine and list new businesses and industries created by the do-it-yourself concept and more available leisure time.

Affective:

Promotes better use of his leisure time through the use of do-it-yourself projects.

Skills Used:

1. Efficient use of leisure time.
2. How leisure time effects land use.

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will research how the do-it-yourself and leisure activities have changed industries, transportation and population centers.
B. Discuss how the sale of RV's have made an impact on the metals industry.
C. What role is industrial arts providing in basic skills for the do-it-yourself concept--specifically in metals area?

Outside or Community:

A. Local building supply dealer to discuss do-it-yourself materials.
B. Local recreational vehicle dealer, i.e.
   1. Pickups
   2. Snowmobiles
   3. Minibikes
   4. ATV's
   5. Boats

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Modern Projects in Wood, Metal and Plastic, Patrick E. Spielman Bruce Publishing. Do-It-Yourself Encyclopedias. **Audio—Visual:** **Community:** Local building supply dealer. Local recreational vehicle dealer.	

E. S. E. A. Title III -- PROJECT I-C-E 59-70-0135-4

Environmental:

Integrated with:

CONCEPT NO. 8 - Values and Attitudes

SUBJECT Industrial Arts (10-12)

ORIENTATION The Ramifications of Change

TOPIC/UNIT Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Determine a flow chart pointing out the effects and conflicts in cultural, economic, social, and political areas brought about by a metal-industry problem.

Affective:

Tests the cultural, economic, soical, and political interactions brought about by a problem in the metalworking industry.

Skills Used:

1. Cause-effect thinking.
2. Political processes.
3. Economics of change.

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Discuss local or widely known pollution problem pertaining to metals industry, i.e.
   1. Water pollution--Lake Superior
   2. Noise pollution--Foundry
   3. Air pollution--Foundry, steel mill.

B. Either--
   1. have open discussion as to what effects an attempt to clear up a pollution problem has on each aspect of society, i.e., Society gets excited, fires up politicians, they chase industry, try to force change. Products prices go up to meet increase, etc.

   -or-

   2. organize round table discussion between industrial representative, economist, and politician to bring out changes caused by attempting to solve an industrial pollution problem.

Outside or Community:

A. Local economist for round table discussion.
B. Industrial Commission Rep.
C. Local politician for round table discussion.
D. Representative of local metal-fabricating industry.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Audio–Visual:

#03140 - Air Pollution,
University of Illinois film.
#4513, Make Steel--But Keep It Clean,
Modern Talking Picture Service
Milwaukee, Wisconsin.

Community:

Local economist.
Industrial Commission Rep.
Local politician.
Rep. from local metalworking plant.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 9 - Management

SUBJECT Industrial Arts (7-12)

ORIENTATION Foundry Pollution Abatement

TOPIC/UNIT Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Describe two foundries that have installed pollution abatement equipment.

Affective:

Observes that foundries produce not only castings but also air, water and noise pollution.

Skills Used:

1. Man can manage pollution if he wants to.
2. Various forms of pollution affect human behavior.
3. What pollutants are produced by foundries.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. View movie: Iron: Product of the Blast Furnace.
B. Class discussion:
   1. What pollutants are produced by a foundry?
      a. Air
      b. Water
      c. Noise
      d. Thermal
   2. Are the pollutants an environmental hazard? How? What is being done? What can be done?
C. Relate the results of the discussion back to Concept #9.
D. Progress survey - what has been done by industry:
   1. by changing technologies?
   2. by installing treatment facilities?
   3. What still remains to be done?

Outside or Community:

A. Environmental engineer from foundry to discuss pollutants.
B. Local industry rep. in whose company pollution abatement equipment has been installed.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Exploring Patternmaking and Foundry, Miner & Miller D. VanNostrard Company. **Audio–Visual:** #80067, Noise & Health, University of Illinois. #1100, Iron: Product of the Blast Furnace, BAVI. #4513, Make Steel-But Keep It Clean, Modern Talking Picture Service Milwaukee, Wisconsin. Field Trips Out of the Ordinary, ICE RMC, Kit 48. **Community:** Environmental engineers. D.N.R. Local industry rep.	1. Develop a collection of local newspaper articles which discuss local industry related pollution problems so that a chronological sequence can be followed.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 10 - Economic Planning **SUBJECT** Industrial Arts (7-12)

ORIENTATION Mining Waste **TOPIC/UNIT** Metals

BEHAVIORAL OBJECTIVES

Cognitive:

List the way man's early mining is now costing us money to reclaim the land.

Affective:

As an adult, the student attempts to be a concerned citizen about land use and mining operations.

Skills Used:

1. Land reclamation.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will view film on open pit mining.
B. Students will view slides of old abandoned open pit mines to view how the area is a total waste land.
C. Students will develop plans that could have been used to reclaim the area as it was mined.
D. Students will develop plans that could be used to reclaim these areas today.

Outside or Community:

A. Mining company rep. to discuss mine waste.
B. Land developers to discuss reclaiming mine areas.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Encyclopedias. Forging and Welding, Robert E. Smith McKnight & McKnight. **Audio—Visual:** #51311 Copper Mining, University of Illinois. #1198 Iron Ore Mining, BAVI. **Community:** Land developer.	

E. S. E. A. Title III — PROJECT I-C-E 59-70-0135-4

Environmental:

Integrated with:

CONCEPT NO. 11 - Individual Acts

SUBJECT Industrial Arts (7-12)

ORIENTATION Alleviations of Waste

TOPIC/UNIT Metals

BEHAVIORAL OBJECTIVES

Cognitive:

List five places in which cumulative error will lead to waste.

Affective:

Tests how a small error multiplies into a large waste.

Skills Used:

1. Accuracy in measurement.
2. Economics.
3. Multiplication of error.

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Basically a general discussion using examples:
   1. Three classes cutting stock from large piece; if each person cuts his 1/16" oversize, a full piece or more is wasted, before work is started.
   2. One person welding without system to exhaust fumes, result is negligible. Many persons welding without exhaust system could be fatal.

B. Relate "one instance not too bad, but many instances can be dreadful." Theory to environmental problems, i.e.
   1. Exhaust emission
   2. Water pollution
   3. Environmental deterioration.

Outside or Community:

A. Quality Control personnel.
B. Purchasing agent to discuss waste.
C. Salvage engineer to discuss reclamation.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Metalwork Technology and Practice, Ludwig & McCarthy, McKnight & McKnight. Technical Metals, Harold V. Johnson Chas. A. Bennett Company. **Audio—Visual:** Home-made slide series of photo series showing areas or examples of great waste. Film: Junkdump, Project ICE RMC #310. **Community:** Quality control person. Purchasing agent. Salvage engineer.	1. Have students develop easy reference list or bulletin board stating where small wastes should be avoided. 2. St up "point system" and see what member of class can find most instances of waste in 1. school 2. local community.

E. S. E. A. Title III -- PROJECT I--C--E 59--70--0135--4

Environmental:

Integrated with:

CONCEPT NO. 12 - Stewardship

SUBJECT Industrial Arts (7-12)

ORIENTATION My Rights vs. Your Rights

TOPIC/UNIT Metals

BEHAVIORAL OBJECTIVES

Cognitive:

Describe five "wastes" and explain how these "wastes" affect others.

Affective:

Investigates all pollutants and how wastes violate the rights of others.

Skills Used:

1. Individual acts affect others.
2. How pollutants are controlled.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion:
   1. Select a few metalworking industries and develop a list of wastes produced.
   2. How do these "wastes" affect others?
   3. Is the effect desirable or undesirable?
   4. What can be done?
   5. What is being done?

B. Study thru class developed method, the interaction of "rights."

C. Begin waste salvage program.
   1. Contact scrap dealers who will purchase metal waste.

Outside or Community:

A. Public Relations Dept. of local manufacturing plant.

B. D.N.R. to discuss disposal of waste from metal industries.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Metalwork Technology and Practice Ludwig & McCarthy McKnight & McKnight. Modern Metalworking, John R. Walker Goodheart-Willcox. **Audio–Visual:** #4513, Make Steel-But Keep It Clean, Modern Talking Picture Service Milwaukee, Wisconsin. **Community:** Public relations man from local manufacturer. D.N.R.	1. Have students research how local manufacturers handle "encroachment of rights."

Extra Credit Topics and Terms for Students Environmental Study and Exploration.

METAL WORK

1. Iron Mining
2. Foundry Operations
3. Welding
4. Steel Manufacture
5. Annealing of Metals
6. Chemical Machining
7. Forging
8. Pickling
9. Casting

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 1 - Energy **SUBJECT** Industrial Arts (7-12)

ORIENTATION Application of Sun Energy **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Develop an experiment using sun energy and explain how his results can be applied to our technological society. Describe several problems in using sun energy.

Affective:

Reject the idea that the use of sun's energy directly is too costly and impractical to be used on a large scale within the next few years.

Skills Used:

1. Experiment design
2. Cause-effect thinking
3. Testing
4. Brainstorming
5. Circuitry and wiring

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Telephone company representative presentation "uses of sun energy."
B. Film (presentation)
   1. Electrical sources
   2. Production
C. Read related text units.
D. The students will write a philosophical (dream)paper on sun energy use and its application to our society.
E. By individuals or small groups, develop sun energy experiments.
F. Suggest several environmental problems associated with construction and operations of solar energy power generators as described in July, 1972, Popular Science.
G. Review use of solar energy on space probe vehicles by NASA.

Outside or Community:

A. Telephone Company.
B. Local Power Company.
C. Weatherman.
D. Physics Teacher.
E. In the community, the students will locate direct uses of sun energy.

SUGGESTED RESOURCES

Publications:

Modern General Shop,
Walter Brown
Goodheart-Willcox.
Popular Science, July, 1972.
Electricity and Electronics-Basic
Steinberg-Ford
American Technical Society.

Audio—Visual:

#53623 Electricity: Electrical Sources.
#62900 Electricity: Production
Univ. of Ill., Champaign, Illinois.

Community:

1. TelephoneCompany.
2. Local Power Company.
3. Weather Company.
4. Physics Teacher.

Bell Telephone educational rep.
1-922-5211. Collect call Miss A. Hoey, Fond du Lac for available supplies and films.

CONTINUED OR ADDED LEARNING ACTIVITIES

1. Continue developing experiments that show the greatest potential and possible patent and/or copyright.

   Solar generation will require large amounts of solar radiation regularly available. Agricultural or industrial development in this (desert type) area can cause climatic change that reduces the efficient conversion capacity of the solar generation bank.

2. Have advanced student or students construct "From Sun to Sound" Bell System Science Kit ASE-1A.

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental:

Integrated with:

CONCEPT NO. 2 - Ecosystem

SUBJECT Industrial Arts (7-12)

ORIENTATION Relationship of the Electrical Circuit to an Ecosystem.

TOPIC/UNIT Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Compare a community to an electrical circuit and explain what happens if one part stops, changes, etc. in writing. Describe effects of the failure of one or more components in an electrical circuit.

Affective:

Accept the fact that there is interaction in an electrical circuit even though he cannot see electricity.

Skills Used:

1. Principles of an electrical circuit.
2. Systems analysis.
3. Primary circuit elements
   a. volts
   b. Amps
   c. Ohms

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

A. Film presentations:
   1. Flow of Electricity
   2. Elementals of Electrical Circuits
B. Using components, develop and explain a simple electrical circuit. Teacher or student.
C. Have students identify circuit components.
   1. Power
   2. Load
   3. Return wire
   4. Gauges
   5. Protection
D. Evaluate circuit
   Test - Result
   1. Design - Works
   2. Vary Load - Blow fuse
      Burn wire
   3. Vary power - Load does not work
   4. Break circuit - Won't work
E. Compare circuits to a community, class discussion groups or homework.
   1. Power=Food, fuel, etc.
   2. Load=People, demand
   3. Return wire=Waste disposal
   4. Gauges=Communication
   5. Protection=Limiting factors available, land, housing, food, etc.

Outside or Community:

A. Sociologist.
B. Have students find examples in the community and relate them to the basic circuit and its function.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Interior Electric Wiring
Kennard C. Graham
American Tech. Society
Chicago, Illinois.
Electrical Construction Wiring,
Walter N. Alerich
American Tech. Society
Chicago, Illinois.

Audio–Visual:

Flow of Electricity, BAVI.
#29800 Elements of Electrical Circuits,
Univ. of Illinois
Champaign, Illinois.

Community:

Sociologist

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 3 - Carrying Capacity **SUBJECT** Industrial Arts (7-12)

ORIENTATION Determining Carrying Capacities **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Experiment to find the maximum output capacity possible for a given fixed power source and then compute this capacity using mathematics.

Affective:

Suggest that another circuit be planned for and installed if the fuse or circuit breaker disconnects frequently, as a measure of safety.

Skills Used:

1. Electrical computations
2. Load Capacities
3. Function of fuses

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Have each student load a fused (20 Amp) circuit with household appliances until it becomes overloaded.
   1. Toaster
   2. Coffee pot
   3. Electric fry pan, etc.

B. Discuss circuit handling capacity, and how to compute Amps.
   1. Amps=Watts/volts
   2. Sum of amps. drawn by each appliance cannot be larger than supply amperage.

C. Have students design and set up different appliance combinations which will not overload circuit.

D. Discuss safety factors concerning electrical house circuits.
   1. Nat. elec. code-80% of amperage maximum
   2. Fire hazards

E. Relate overloading problems to today's problems of overcrowding and over-use of resources and products

(Continued)

Outside or Community.

A. Electrician.
B. Have students survey neighborhood for hazardous electrical wiring situations, start a drive to re-work or have something done about inferior wiring facilities.
C. Public Service Rep.
D. Underwriters Lab.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Electricity, Goodheart-Willcox Howard H. Gerrish. Basic Electricity, McGraw-Hill Paul B. Zbar Introduction to Electricity and Electronics, Delmer Loper and A.H.R. **Audio–Visual:** Transparencies to Aid Explanation of Ampere Computation. **Community:** Electrician Public Service Rep. Possibly Rep. from Underwriters Lab.	1. Conduct community wide drive to inform persons in area about overloading circuits, and try to get local people (especially in older homes) to update their electrical wiring systems.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 4 - Water **SUBJECT** Industrial Arts (7-12)

ORIENTATION Production of Electricity **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

List six environmental losses caused by the production of electricity. Compare the losses of the resources for each of the three main types of electrical power generation.

Affective:

Demonstrate an awareness of environmental loss due to the production of electricity. Choose to turn off lights and electrical equipment when not in use. Go out of his way to turn off lights and equipment left on by himself or others. (He must check to be sure that they were not on for a purpose.)

Skills Used:

1. How electricity is produced.
2. How the production of electricity effects our environment.
3. How to develop a questionnaire.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Class discussion on how electricity is produced.
   1. What kinds of pollution are produced by the production of electricity?
   2. How much of this pollution is produced?
   3. What are the environmental effects of this pollution?

B. Students will make a bulletin board showing environmental losses caused by producing one mega-watt of electricity by
   1. burning fossil fuel
   2. water power
   3. nuclear energy.

C. Students develop questionnaire and conduct community survey on the following question: To reduce pollution caused by the production of electricity, which would you rather do; pay 1/5 more for electricity each month, or be required to reduce use of electricity by 1/5 each month?

D. Construction of models of the various types of generating stations for placement in sand table display with environmental impact effects associated

(Continued)

Outside or Community:

A. Speaker from local power company.

B. Field trips to hydroplant, nuclear plant, and fossil fuel plant.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Environmental Cost of Electric Power, Scientists Institute for Public Infor. 30 E. 68th St., N.Y., N.Y. 10021. National Wildlife, National Wildlife Federation April-May, 1972, P. 18. **Audio-Visual:** Electricity: How It Is Generated, #0479, BAVI. **Community:** Rep. from local power company.	In-Class: (Continued) with construction and operation of same.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 6 - Resources **SUBJECT** Industrial Arts (7-12)

ORIENTATION Transmission of Electrical Energy **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

List three problems in moving electricity from production plant to consumer. List the natural resources used to produce electricity. Evaluate the production of electricity and its effect on the immediate environment, i.e. coal generation-smoke gases and dust.

Affective:

Be aware that the production of electricity has changed the environment by finding examples within the state, while on a trip or from resource books.

Skills Used:

1. How electricity is produced.
2. How the production of electricity affects our environment.
3. How electric power is transmitted.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will study how natural resource distribution affects methods of electricity production.
   1. How is electricity produced in states that have large supplies of water?
   2. How is electricity produced in states that have large supplies of coal?
   3. How is electricity produced in states that have large supplies of oil or natural gas?
   4. How is electricity supplied in areas that have none of the resources used to produce electricity?
   5. How has energy crisis affected the production of electricity?

B. Students will study how man has manipulated his environment to produce and transmit electric power.
   1. Building of dams to produce electricity.
   2. Building power transmission lines.

Outside or Community:

A. Rep. from local power company to discuss production of electric power as determined by natural resources.

B. Field trip to electric power plants of different types.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Environmental Cost of Electric Power, Scientists Institute for Public Infor. 30 E. 68th St., N.Y., N.Y. National Wildlife, National Wildlife Federation April-May, 1972, P. 18. **Audio–Visual:** #50774, Dams, Univ. of Illinois, Champaign, Illinois. #5832 Electricity; Distribution, BAVI. **Community:** Rep. from local power company.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 7 - Land Use

SUBJECT Industrial Arts (7-12)

ORIENTATION Factors in the Production of New Hydroelectric Power

TOPIC/UNIT Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Seven considerations and their involvement in hydroelectric dam building.

Affective:

Appreciate the complexity of involvements in developing hydroelectric power by citing procedures before building, while building and while operating.

Skills Used:

1. Production of hydroelectric power.
2. A project's impact on the environment.
3. Planning of a project.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Have selected students read book, Manic 5.
B. Panel discussion about the hydroelectric dam's environmental impact on the following areas:
   1. Transportation
   2. Natural Resources
   3. Population growth
   4. Leisure time use
   5. Economic factors
   6. Land use changes
C. Field trip to local hydroelectric dam (Peshtigo River has 5).
   1. Evaluate dam's environmental impact and relate to Manic 5.
      a. Changes in wildlife
      b. Changes in land use
      c. Changes in water quality.

Outside or Community:

A. Field trip to hydroelectric dam.
B. Representative from power company to discuss effects of dams.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Manic 5.
Modern General Shop,
Goodheart-Willcox.

Audio–Visual:

#82045, The Dam Builders.
#50774, Dams.
#53537, Man Changes the Nile.
#05800, Water Power,
University of Illinois
Champaign, Illinois.

Community:

Rep. from Power Company.
Fox River, 2 power dams near Kaukauna,
1 at Appleton.
Peshtigo River.
Menominee River, Wolf River.

1. What other uses does a hydroelectric dam have besides producing power?

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 8 - Values and Attitudes **SUBJECT** Industrial Arts (7-12)

ORIENTATION The Alternatives to Thermal Pollution **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Research a specific thermal pollution alternative and write an opinion paper. Evaluate the production of electricity for each of three types of generators in terms of: a) cost b) loss to the environment c) safeguards necessary. The student will select the best method and give his reasons.

Affective:

Be aware of factors related to thermal pollution from atomic energy production and list this as a disadvantage of the atomic energy electrical generators.

Skills Used:

1. How electricity is produced by atomic energy.
2. What is thermal pollution and how do you handle it?
3. Brainstorming.
4. Safety standards for atomic energy generators.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. After discussing the production of power using atomic energy, tackle the following problem:
Since the water used in cooling an atomic reactor is considered thermal pollution. what alternatives are available?
   1. It is not a problem
   2. Use a cooling tower
   3. Pipe it for residential heating
   4. Put pipes in road for snow and ice removal
   5. Various industrial uses
   6. Fish pond culture/cooling
   7. Brainstorm other uses.

B. Debate aforementioned class-developed list on pros and cons.

C. What effect will warming Lake Michigan have on drinking water quality of city water (e.g., Green Bay), from blue-green algae tastes?

Outside or Community:

A. Rep. from AEC to discuss thermal pollution.
B. Discover within the community other sources of thermal pollution.
C. Marine biologist/limnologist.
D. Fishery biologist, DNR.
E. Site visitation, visitor center, Point Beach Nuclear Plant, Two Creeks, Wis. (highly recommended)

SUGGESTED RESOURCES

Publications:

Literature from AEC,
address below.

Audio–Visual:

Power and Promise,
AEC Chicago Operations Office
Office of Information
9800 S. Cass Avenue
Argonne, Illinois, 60439.

Community:

AEC (Atomic Energy Comm.).
Marine biologist, UW-GB.
DNR Fishery division.
Wisconsin-Michigan Power Co.,
Appleton, Wis. (co-operators of
Point Beach Nuclear Reactor.).
Wisconsin Public Service, (operator
of Carlton Nuclear Reactor).

CONTINUED OR ADDED LEARNING ACTIVITIES

1. With two aquariums set up with fish and vegetation, induce thermal pollution and observe results.

TECHNICAL NOTE: Temperatures above 85-90 degrees become damaging to most warm water fish. Temperature above 70-75 degrees become damaging to most cold water fish, such as trout and white fish.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 10 - Economic Planning **SUBJECT** Industrial Arts (9-12)

ORIENTATION Proper Home Wiring **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

List three areas in house wiring where meeting code minimums may prove insufficient over a period of time, and why. Define flat-rate and explain why it is used. Evaluate the practice of construction of buildings without having the electrical wiring inspected.

Affective:

Realize the need for planning ahead in house wiring and using proper materials even though the cost may be higher. Defend the enforcement of electrical codes as a way of saving lives and property.

Skills Used:

1. Cost analysis sheets.
2. Electrical codes.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Presentation on local electrical building codes and requirements by building inspector or local electrician.
B. Discuss why these codes should be met and even exceeded.
   1. Added appliances in future.
   2. Failure of minimum facilities.
C. Introduce and discuss flatrate book for electrical work-new work vs. remodeling. (Minimal equipment and facilities will have to be replaced as time goes on and other appliances are added, etc.)
   1. Install outlet-new $15.
   2. Install outlet-remodel work, $30.
D. Brainstorm wastes brought about by necessity of re-wiring.
   1. Natural resources in building materials of walls must be dismantled.
   2. Copper from wire which must be discarded and replaced.

(Continued)

Outside or Community:

A. Building inspector to discuss electrical codes.
B. Local electrician.
C. Local contractor.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Contractors Flat-Rate Manual. National Electrical Code, National Fire Protection Assoc. Wisconsin Administrative Code, Public Service Commission. Wiring Simplified, Sears, Roebuck & Company. **Audio–Visual:** **Community:** Local electrician. Local contractor. Building inspector.	In-Class: (Continued) D. 3. Time needed to make necessary changes. 1. Set up model or mock-up of wall section and have students actually install an outlet (in bare framing). Now put in inside wall covering (i.e. paneling) and have students install outlet in finished wall. Note difference in time and effort involved.

E. S. E. A. Title III — PROJECT I—C—E 59—70—0135—4

Environmental: **Integrated with:**

CONCEPT NO. 11 - Individual Acts **SUBJECT** Industrial Arts (7-12)

ORIENTATION Magnetism **TOPIC/UNIT** Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Construct an electromagnet and vary its carrying capacity. Explain the use of an electromagnet and varying the turns of wire as being an analogy to that of pollution and number of people.

Affective:

Defend the idea that every individual act changes the system of which it is a part.

Skills Used:

1. How to make an electromagnet.
2. How to increase the force of an electromagnet.
3. How individual acts compound.

STUDENT—CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will study the methods of increasing the strength of an electromagnet.
   1. Increase current
   2. Increase turns of wire
   3. Increase size of core
   4. Change core material.

B. Students will make an electromagnet and keep adding turns of wire until current flow is too low and system fails.

C. Discuss how A & B relate to environmental problems.
   1. Throwing paper on streets
   2. Too many taps on water line
   3. Overloading sewage plants
   4. Overloading power supply.

Outside or Community:

A. Rep. from telephone company to speak on electromagnetism.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Modern General Shop, Walter C. Brown Goodheart-Willcox. Introduction to Electricity and Electronics, Loper and AHR Delmar Publisher. **Audio–Visual:** Electromagnets: How They Work, #01153, University of Illinois, Champaign, Illinois. Ferromagnetic Domain Unit, Bell Telephone Company. **Community:** Rep. from Telephone company.	

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 12 - Private ownership as Stewardship

SUBJECT Industrial Arts (7-12)

ORIENTATION Conservation of Electrical Energy

TOPIC/UNIT Electricity-Electronics

BEHAVIORAL OBJECTIVES

Cognitive:

Identify wasted energy use. List ways that energy is usually wasted by a person each day. Describe several ways by which the average citizen can save energy each day.

Affective:

Take steps to conserve electrical energy in his home. Choose to reduce electrical energy use in his home even if it means that he will have some discomfort or inconvenience.

Skills Used:

1. Methods of conserving electrical energy.

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students will develop a list of ways man is wasting electrical energy.
   1. Signs
   2. Ornamental lighting
   3. Unnecessary gadgets
B. Discuss how wasting energy creates need of more power plants.
   1. Economic loss
   2. Environmental affects
C. Discuss methods of getting people to conserve electrical power.

Outside or Community:

A. Rep. from area power company.
B. Small appliance dealer to discuss new small appliances.
   1. Toothbrush
   2. Air freshner
   3. Razor
   4. Comb
   5. Blankets

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: How to conserve electricity and gas for increased economy and efficiency, Wisconsin Public Service Corp. A Consumer's Guide to Efficient Energy Use In the Home, Gas Appliance Manufacturers Assoc. 1901 N. Fort Myer Drive Arlington, Virginia 22209. **Audio–Visual:** **Community:**	

Extra Credit Topics and Terms for Students Environmental Study and Exploration.

ELECTRICITY-ELECTRONICS

Students are to relate information involving these terms to the environment in a written or oral report.

1. Production of Electricity
2. Heat Pumps
3. Toxic Gases
4. Nuclear Energy
5. Solar Cells
6. Ultra-violet Rays